Watershed Database and Mapping Projects/St. Andrew Bay

Protection and restoration of coastal watersheds requires the synthesis of complex environmental issues. Contaminated site remediation, dredging and disposal of contaminated sediments, and restoring injured habitats are a few of the challenges facing coastal managers. The evaluation of multiple environmental issues can be significantly improved by combining scientific data and watershed characteristics into a Geographic Information System (GIS). NOAA's Coastal Protection and Restoration Division (CPRD) has developed Watershed Database and Mapping Projects (Watershed Projects) that combine a standard database structure, database-mapping application (Query Manager) and GIS. Contaminant concentrations in sediment and tissues of aquatic organisms, results of sediment toxicity tests, natural resource occurrence, and potential habitat restoration projects are overlaid on a watershed's features and landuses, to be analyzed and displayed on maps at flexible spatial scales. This approach simplifies data synthesis and presentation, provides a valuable tool for complex decision-making, and improves our understanding of dynamic aquatic ecosystems.

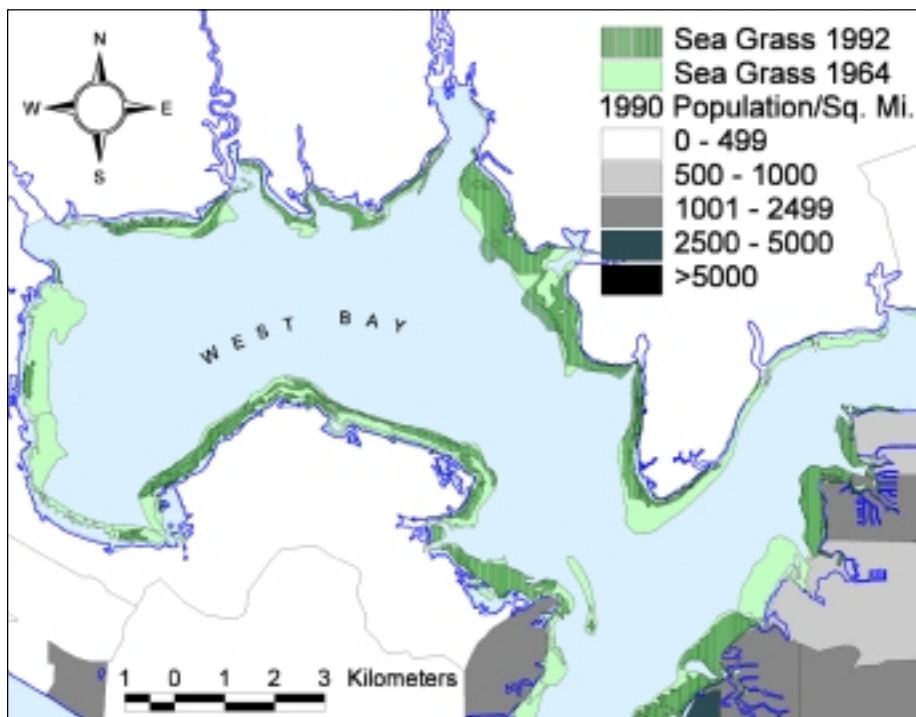**NOAA has used this approach in six pilot watersheds** affected by contaminant releases from Superfund sites and other sources: Newark Bay, San Francisco Bay, Christina River, Sheboygan River, Puget Sound, and Calcasieu Estuary. These Watershed Projects use the standard structure along with information tailored to the major objectives of each watershed. For example, the Newark Bay Watershed Project supports decisions about remediation and disposal of contaminated sediment, while the San Francisco Bay Watershed Project focuses on Superfund site remediation and habitat restoration. The common organizational structure for data and spatial information promotes data sharing among Federal, state, and local agencies working within a watershed.

CPRD developed the St. Andrew Bay Watershed project to help cooperating agencies preserve the biodiversity of this estuarine ecosystem. The system consists of three connected, high salinity embayments adjacent to Panama City, on the eastern Florida panhandle. Local observers indicated that *Thalassia*, a subtidal seagrass that provides high quality habitat, had decreased in area throughout the system. *Thalassia* fields are more difficult to restore than other types of seagrasses.

In cooperation with the U.S. Fish & Wildlife Service, the NOAA National Marine Fisheries Service, the Florida Department of Environmental Protection, and Gulf Coast Community College, CPRD created a database of geo-referenced sediment contaminant concentrations. Spatial analysis of these data show that toxic contaminants in sediment are primarily restricted to bayous with adjacent industrial uses.

Aerial photographs from the winters of 1964 and 1992 confirm a seagrass loss over the entire St. Andrew system of 747 hectares (1,840 acres), or 16%. Most of this decline was in West Bay, an undeveloped embayment, where seagrass coverage declined by 496 hectares (1,220 acres), a loss of 39%. The project combines landuse data with seagrass coverage, suggesting that seagrasses are more resilient in areas adjacent to salt marshes and unmanaged evergreen forests. The

| | Sea Grass 1992 |
| | Sea Grass 1964 |

1990 Population/Sq. Mi.

	0 - 499
	500 - 1000
	1001 - 2499
	2500 - 5000
	>5000

Seagrass coverage in West Bay, near Panama City, on the eastern Florida panhandle. The GIS coverages, developed by the U.S. Geological Survey from aerial photos taken during the winters of 1964 and 1992, show that seagrass in West Bay has declined by 496 hectares (1,220 acres), a loss of 39%.

project is designed to help analyze changes in seagrass distribution in St. Andrew Bay and to provide insight into conditions that may inhibit or enhance the survival of this important marine species.

NOAA's approach is to provide a rapid, convenient way to create maps of the watershed that display analyzed, sorted, and summarized data that coastal managers have selected from a menu of programmed queries. The primary data types stored in the database include sediment chemistry, sediment toxicity, and tissue chemistry data. The base maps display geomorphology, habitat characteristics, and landuse information. Integrating remedial investigation data with landscape information in a single system helps investigators associate the distribution of contaminants with specific sources and evaluate the possibility of contaminant effects in potential habitat restoration areas. Combining restoration information and contaminant distributions across the watershed enhances the potential for successful restoration of wide-ranging populations.

The watershed projects have benefited a variety of user groups and have enhanced cooperation and data sharing. The database mapping system allows users to:

- Evaluate multiple data sets within a geographic area;
- Identify chemical concentration and toxicity gradients;
- Prioritize problem areas based on sediment chemistry, sediment toxicity, and/or tissue chemistry;
- Catalog and evaluate potential habitats for restoration;
- Identify important data gaps; and
- Add and share new information.

Analytical tools such as database queries and import/export scripts developed for one project can be applied to all projects because of the common database and GIS project structure. Query Manager can be used to select and export data to any program that supports standard spreadsheet, database, or tab-delimited text files. Scripts have been developed for seamless import of data from Query Manager, to an ArcView® GIS project to enhance and simplify further data analysis and presentation.

The Watershed Projects run on standard desktop Macintosh® and Microsoft Windows®-based personal computers. The database and mapping application, Query Manager, is an easy-to-use, interactive system that allows you to query the database and rapidly display the results on a map in MARPLOT® or deliver the data in the appropriate form to an ArcView® GIS project. In addition, both standard and customized basemaps are developed in ArcView to support all Watershed Projects. Standard layers include wetlands, Superfund sites, and regulated industrial facilities. Digitized ortho-rectified aerial photographs and other spatial data layers also are routinely used with data from the Query Manager database.

CPRD's Watershed Projects are proving useful throughout the remedial decision-making process, from identifying locations for the collection of additional samples to providing the historical context for interpreting data, to identifying areas for restoration. This versatile tool improves NOAA's ability to protect and restore the biodiversity of watersheds that contribute to healthy coastal habitats.

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